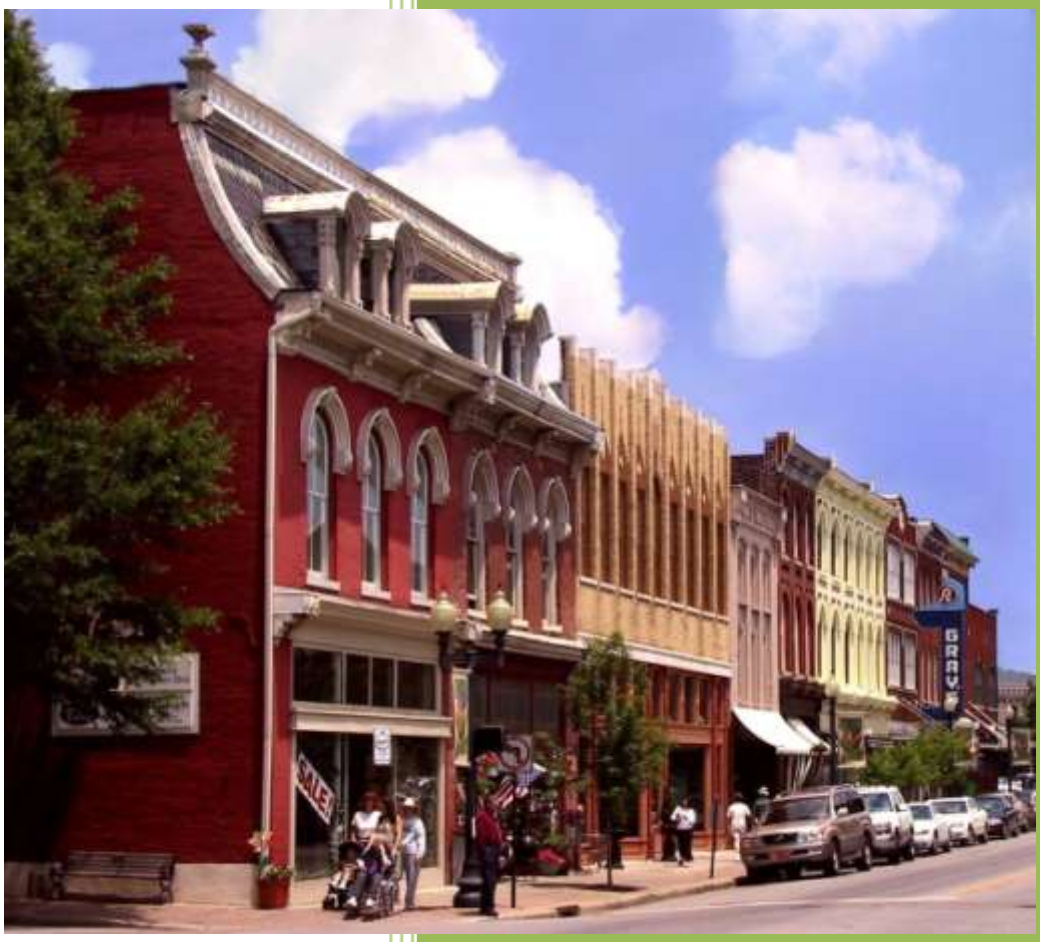
2011

Best Sustainable Practices



Franklin, TN

Lipscomb University

4/19/2011

This Sustainable Best Practices Report was submitted by students from the Institute of Sustainability at Lipscomb University in Nashville, TN. They were asked to identify issues, describe each sustainable best practice, and provide recommendations for five topics requested by Franklin, TN. There was over 450 man hours put into this report by seven graduate students and one professor.

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Executive Summary

While Franklin, TN has been proactive ensuring development, incorporating more sustainable features into development projects could be strengthened. New technology, the increased cost of energy usage, and the demand for high performance buildings and infrastructure are working in concert to gradually transform the way we construct our cities.

The Planning and Sustainability Department of Franklin, TN seeks a sustainable development best practices guide that draws off the best practices in the south region to give reliable information. This guide has several sections focusing on, but not limited to the incorporation of alternative energy, successful green infrastructure examples, appropriate infill development, integration of local food systems, and addresses adaptive reuse of existing buildings.

Franklin, TN and the Planning and Sustainability Department intend to consult this guide during the application review process to encourage developers and their design consultants to incorporate some of the best practices when appropriate.

What is Sustainability?

Sustainability is about leaving this world better than we found it for our children and our children's children. Sustainability is sometimes illustrated as the triple bottom line, comprised of social (people), economic (financial), and environment (planet). This report illustrates how better social and environmental initiatives can help Franklin, TN optimize their financial potential. These are the foundation for our quality of life and in order for Franklin to thrive today and tomorrow, all three pillars need to be strong. The sustainable Franklin we envision integrates all three elements into the decision making process.

Sustainability (Sus·tain·abil·i·ty) *noun* –

Refers to the implementation of practices that maximize the longevity and quality of existence for an individual or group through optimization of fiscal, global, and community well-being.

Infill Development

By: Susan Adamson

The small town identity serves the community and government in establishing a brand for Franklin that is successfully marketable to tourists, townspeople, and developers. To preserve this brand, Franklin has a solid set of zoning ordinances that have been amended in 2010. Tying Franklin's small town identity to progressive planning confirms Franklin's thought leadership that can continue through implementation of additional actions in this document.

New Urbanism. Smart Growth. New Community Design. Traditional Neighborhood Development. These are newer names for infill development that is created with thoughtful planning for livable communities according to the TDM Encyclopedia (New Urbanism, 2010). Franklin is incorporating The Traditional Neighborhood Development (TND) into its zoning ordinances.

Applicable Definitions and Supporting Principles

As the name implies, TND is a return to small town roots with access to services within walking distance, reducing traffic and sprawl. A central civic facility and 10%-20% open space are the core of the community surrounded by mixed use buildings and residential units covering a range of affordability. This whole area would be 10-15 acres with one-fourth mile being the maximum distance to walk. These planned areas are multifaceted in their approach to caring for people and the environment while being financially responsible (www.mass.gov/envir/smart_growth_toolkit/pages/mod-tnd.html).

Additional definitions needed in the zoning ordinance include greenfields, grayfields, brownfields, and blackfields. Greenfields refer to the natural, undeveloped landscape. Grayfields include vacant structures, often but not implicitly on a larger scale such as industrial. Brownfields, with or without structures, may have contaminated soils. Blackfields are abandoned areas such as a mine or quarry that typically is contaminated and costly to redevelop (Kibert, 2008). With the exception of greenfields, these are the areas that typically have access to existing infrastructure. Development of these various "fields" helps to increase density; they should have an incentive attached to the property to make them more attractive for redevelopment.

City planning shapes the character of the city. Locally, the city manages the growth equitably, maintains the beauty, and contends with unsuccessful developments. Most developments are intended to supplement the tax base, but a few strain the system. The impacts that matter the most become guidelines.

Less expensive land on the outskirts of town makes it the preferred area for a developer. However, this contributes to sprawl and undermines the city's plans for increasing density within the Urban Growth Boundary (UGB). Transfer Development Rights, which Franklin established, allow for a sense of equity in establishing the value of greenfield properties and provide the incentive to develop infill properties without financial contributions from the city's coffers. In this case, the suburban land owners in the sending area would transfer their development rights and sell them to a developer for the ability to build higher density developments in the designated receiving area, preferably infill areas (Transfer Development Rights Legislation, 2008).

The Charleston Green Plan 2010 has a similar infill definition as Franklin, with the following inclusion: "This [infill development] can accommodate for an increasing population without creating urban sprawl" (Charleston Green Plan, 2010). This is a strong guiding tenet for the city's planning. The redevelopment of brownfields raises the property value of adjacent lots when the project is successful. By increasing density and inhibiting sprawl, the city optimizes its financial resources. Franklin's appreciation for the beauty that surrounds the city is evident by not allowing sprawl to take over the hills. They are a vital asset to the city in maintaining its character and appeal.

Causes and Concerns

Cities spend millions of dollars annually for demolition of blighted properties according the 2009 Vacant and Abandoned Properties report from the Conference of Mayors. Louisville has 1,563 abandoned or vacant properties as of 2009. While some cities like St. Louis spend over $3 million for demolition annually, others like St. Paul spend that much just to maintain the properties (Vacant and Abandoned Properties, 2009). Nationwide, the amount of construction and demolition debris is a staggering. This unmerited contribution to landfills is partially due to financial burdens that absentee owners place on cities. Maintaining vacant properties negatively affects multiple city departments such as the Police to patrol areas to prevent crime; Public Works to maintain the lawns; and administrative staff to track down absentee owners. All but

Figure 1: The Gulch Redevelopment Plan

three of the 60 cities surveyed did not have a serious problem with vacant and abandoned properties (Vacant and Abandoned Properties, 2009). A proactive plan must be in place to avoid this waste of finances and human capital in preventing foreclosed and abandoned properties from becoming the seed for infill.

The brownstone development, a block off the square in Franklin, is a notable example of successful infill. This development creates a streetscape and is in keeping with materials and sizes of adjacent structures. However, the density can be increased by accommodating more than one family per unit such as the row houses in historic Roscoe Village in Chicago where three homes frequently occupy one building. The revitalization of The Gulch, Nashville's first LEED neighborhood development, is the result of a public-private partnership. The combination of retail, restaurants and residences on a 60 acre tract near downtown is a viable example of infill development with a strong sense of community (The Gulch, 2011).

Benefits and Rewards

Respondents to the quarterly American Institute of Architect's trend survey confirm that infill development that creates compact neighborhoods is the preferred type of development (Binsacca, 2009). To the extent that an entire neighborhood has the benefit of being planned with all the amenities of TNDs or New Urbanist projects, the city can expect less traffic congestion due to a grid street system allowing multiple avenues of entry; and less travel by auto when schools, stores, etc. are within walking distance. The byproduct of TND planning is a healthier population. Appropriate infill improves property values, generates a greater tax base within the UGB and builds a self-sustaining community rather than welfare oriented housing. Consistently incorporating TND concepts in existing areas creates continuity of design in the community fabric.

The essence of sustainability is approaching situations holistically. The chart below shows how infill is integrated with the other major initiatives addressed in this report.

How Appropriate Infill Development Relates to:			
Energy	**Infrastructure**	**Local Food**	**Adaptive Reuse**
Placing solar arrays over brownfields or blackfields minimizes financial risks in redevelopment.	Encouraging rainwater infiltration through pervious paving, bioswales, greenspaces wetland areas reduces damage from runoff.	Fostering community development through gardens that replace vacant property is brings healthy food to local people.	Renovating properties to compliment adjacent structures assures that the aesthetics that Franklin values are maintained.

Regional Best Practices

South Carolina's best practices for infill development include the redevelopment of the old Charleston Naval Base by The Noisette Company (Oak Terrace Preserve, 2009). One of their projects in North Charleston, Oak Terrace Preserve, is a vibrant area that aesthetically reflects Charleston's love of historic architecture. Each home is EarthCraft certified, an accolade acknowledging best practices for sustainable residential construction. Another southern success is Sustainable Fellwood, a Leadership in Energy and Environmental Design (LEED) neighborhood on 27 acres in Savannah, GA. Sustainable Fellwood sits on the site of Savannah's first housing project. This area had similarities to Franklin's historic Natchez and Hard Bargain neighborhoods . The development's green space includes a community garden. There are 220 affordable housing units and to account for a diverse population, they also included 75 senior residences and first-time homes too. The residents' sense of pride and community are being fullfilled in a healthier, safer environment at Sustainable Fellwood (Sustainable Fellwood, 2010).

Recommendations

While Franklin recognizes the value in having infill development blend with surrounding communities aesthetically, the development must also be able to stand independently. Does the community need a grocery store, a park, a gathering place, more homes, a vegetable garden, businesses, or a school? Mixed-use neighborhoods, multigenerational and diverse economic housing opportunities weave a strong community fabric that maintains diversity in a socially reinforcing way. When zoning ordinances prohibit what the community needs, the city loses an opportunity to build a better place.

(1) Create an inventory of all vacant, abandoned, and foreclosed properties to be proactive and reduce the waste of financial resources associated with blighted properties.

(2) Create a list of "first choice" properties for infill development and attach an incentive for the development of these properties.

(3) Relax the zoning ordinances to account for an overall goal relating to percentages of retail, residential, etc. for integrated mixed use districts.

(4) Increase density allowances to create walkable communities, such as seven units per acre (New Urbanism, 2010).

(5) Designate a 'fast track' facilitator to expedite procedures for developers complying to special projects that meet Franklin's goals for infill development (Charleston Green Plan, 2010).

Green Infrastructure

By: Erik Hawkins

In recognizing the benefits that sustainable design can provide in optimizing a community's environmental and economic prosperity, Franklin has begun to explore the role of green infrastructure as a sustainable, cost-effective means of managing the costs and impacts of unmitigated stormwater runoff. Parallel needs to mitigate runoff while improving water quality and prioritizing cost-effective infrastructure investments have propelled green infrastructure and low impact development practices to the forefront of water infrastructure investment strategies for forward-thinking cities across the U.S. (CMT, 2009) Traditional development practices in communities like Franklin promote urban sprawl, reduce open/green space, and trade natural ecosystem and hydrologic services for inferior, costly, man-made alternatives that focus solely on immediate removal of stormwater.

Applicable Definitions and Supporting Principles

Green infrastructure practices and technologies mimic and incorporate natural hydrologic processes allowing for a significant amount of a community's runoff to naturally infiltrate, filter, or be reused in place of valuable potable water sources. On average, 50% of rainwater that falls on a city block washes into storm sewer systems carrying with it a wide variety of pollutants from fertilizers, herbicides, and automotive fluids, to leaves, loose vegetation, and soil which not only degrade the quality of the natural water sources but also clog and damage conventional stormwater management devices (Ghertner, 2009). According to the EPA, up to 70% of all water pollution in US streams and lakes comes directly from stormwater runoff. Successful green infrastructure techniques naturally eliminate or reduce the amount of water *and* pollutants that run off a site and into storm sewer systems and local water sources. By relying on vegetated capture systems stabilized by native vegetation, GI not only conveys and slows surface flow, but the deeper-rooted, better-equipped vegetation allows for greater infiltration and retention into the soil, surrounding root systems, and the groundwater supply.

Causes and Concerns

To better illustrate the impact of GI, research suggests that 30 strategically placed rain gardens in an area such as Nashville, TN, which receives an average of 47in/yr, could capture over 1.2 million gallons of runoff/yr (Calumet County, 2005). Common successful green infrastructure devices include

rain gardens, vegetated swales, permeable concrete/pavement, green roofs, rain barrels and cisterns, trees and tree boxes, and enhanced size and protection of riparian buffers and floodplains. To optimize the success of a green infrastructure (GI) program, the plan should include a variety of these techniques to not only increase the amount of runoff that is ultimately mitigated, but to also improve the efficiency of the other GI techniques.

Franklin is ahead of many cities in having already recognized the potential need and benefits of incorporating sustainable design into their city's future development through the innovative integration of natural ecology and sustainable best management practices. Franklin's Water Management Department and Sustainability Commission have already begun designing, and in some cases implementing, a variety of projects addressing issues like reducing potable water consumption, improving water quality, and intercepting runoff. With its population projected to nearly double over the next twenty years, Franklin has become increasingly aware of the implications this kind of growth will have on infrastructure development, operation, maintenance, and resource management (CDM, 2009). In the 2009 Sustainable Community Action Plan, the city of Franklin laid out its goals for successful future development, and in it, outlined the role GI and improved stormwater management would play in that future, highlighting needs for better controls against sedimentation and erosion, unnecessary potable water use, overburdening water and wastewater treatment facilities, and improvement of the quality of water for the city of Franklin.

The city of Franklin has already begun to integrate numerous GI techniques into its development, providing for itself and other like-minded communities a handful of working effective examples of how GI can be successfully implemented. Table 1 lists a handful of GI-oriented techniques and projects already being developed or employed in Franklin. Some of the more notable examples include the green roof and stormwater-reuse system employed at the new police headquarters, Franklin's new comprehensive Stormwater Management Master Plan, and the 2010 Greenways and Open Space Plan. Franklin is already working towards sustainability from both policy *and* practice, and thanks to the community's vision and planning so far, much of the groundwork for future successful implementation of sustainable techniques and technologies is beginning to be established.

Benefits and Rewards

Increased implementation and data collection regarding green infrastructure have shown economic benefits at all levels throughout a well-designed community associated with GI and low-impact development (LID) opportunities. Some of the more significant economic benefits of GI include: reduction in the volume and energy demand placed on municipal wastewater treatment plants,

reduction in misused potable water demands, increases in property values, improved maintenance of aging and historic sites, and reduction in costs incurred by creating and maintaining transit and traditional stormwater infrastructure devices (roads, sidewalks, curbs, culverts, stormwater retention ponds, gutters, etc.)

Owing to contributions from organizations like the EPA, the Low Impact Development Center, and numerous universities and private consulting services across the country, the environmental and economic benefits of GI and LID projects are becoming increasingly quantified and available. Highlighting some of the more commonly recognized of these:

- Protecting/Improving water quality protects real estate values which protects tax revenues
- Increased infiltration and reduced inflow reduces runoff volume in sanitary sewers which reduces treatment demand and energy consumption for wastewater treatment facilities
- Significant reductions in public spending on stormwater infrastructure development and O&M (savings of up to $70,000/mi compared to conventional infrastructure expenses)
- Increased property values (homes sold for $3,000-$5,000 more on avg.)
- Preservation and enhancement of natural water-quality infiltration/improvement sites (swamps, wetlands, marshes, etc.)

Communities approach the various components of sustainable development from a variety of ways, based on their understanding, need, resources, and goals. Green infrastructure incorporates and integrates numerous innovative and effective techniques in ways that are financially feasible, socially responsible, commercially desirable, and ecologically productive.

Regional Best Practices

A number of case studies outlined in Table 2 illustrate specific examples in which GI implementation directly resulted in economic benefits. These studies illustrate the directly related economic and commercial benefits that have been realized by developers, residents, and city planners in cities similar to Franklin throughout the US.

Recommendations

This report highlights three suggestions of GI techniques for Franklin along with examples of economic benefits realized as a direct result of their employment in locations throughout the US. These strategies were specifically selected based on their high efficiency, cost-effectiveness, innovativeness,

and their requiring minimal maintenance after implementation, all qualities that could make GI development a smooth and effective transition for the city of Franklin.

Vegetated swales are versatile strips of vegetated land that slow and convey water from key areas of runoff and rainwater discharge while allowing for natural infiltration and pollutant filtration. Swales commonly manage runoff from parking lots, athletic fields, and highly-trafficked impervious areas, providing a natural, low-maintenance alternative to conventional infrastructure technologies (e.g. culverts, storm drains, retention ponds, etc.). Using the topography of the area, water is conveyed more naturally through the watershed. Native drought- and flood-tolerant vegetation increases infiltration and retention as well as seasonal stability, reducing the need and cost of maintenance. Well-designed swales are particularly successful at trapping silt and sediment carried in runoff and are designed to drain all retained stormwater within 72 hours of the storm event. Construction and maintenance of vegetated swales cost, on average, a third to a quarter of the cost of conventional stormwater management techniques. A study by the U.S. Army Corps of Engineers found that construction costs of vegetated swales range from \$0.25-\$0.50/ft^2 (University of Florida, 2008). As swales also divert stormwater from other infrastructures, such as roads and sidewalks, maintenance frequency and costs for these have been consistently reduced after the introduction of GI. For one developer, replacing the traditional stormwater management system of drains, curbs, gutters, and culverts with roadside swales, saved \$70,000/mi or \$800/residential lot (NCDWQ). By integrating features that improve water quality, reduce runoff volume, and enhance landscape aesthetics, vegetated swales can be an efficient, cost-effective, and sustainable stormwater mitigation tool for Franklin.

Rain gardens are aesthetically appealing, ecologically functional tools that accomplish a variety of significant stormwater mitigation goals quickly and efficiently. The function of rain gardens focuses more on retention and infiltration. These gardens incorporate native, low-maintenance vegetation, and are designed to slow and capture runoff from roof and gutter systems, often being incorporated into residential landscapes due to their effectiveness, beauty, and more manageable size. An effective rain garden can reduce runoff from yards up to 25%. A 180ft^2 rain garden can capture over 8,000 gallons of stormwater per year. While performance standards can vary based on the soil characteristics of an area, Franklin's predominantly silt/loam soil profile is a prime setting for highly-effective rain gardens.

Rain gardens are not only highly efficient ecologically, but can be very cost-effective and feasible for local governments, developers, and homeowners. While most developers can develop more complex rain gardens at approximately \$10-\$12/ft^2, for only \$3-\$5, homeowners can build these independently (Groundwater Foundation, 2011). In 1990, the city of Somerset, MD introduced rain gardens to several

neighborhoods, putting 300-400ft^2 rain gardens on each 10,000ft^2 lot. By foregoing the installation of traditional stormwater infrastructure, the city saved $4,000/lot which translated to a total of $300,000 after including the *avoided costs* of repairing and adding curbs, sidewalks, and gutters (Huber). In Kane County, IL, it was calculated that the addition of rain gardens in upstream areas would boost the property values of downstream residences from $14,538/acre to $36,345/acre and would eliminate the need for the installation of any new concrete culverts, saving the city $3.3-$4.5 million (Black and Veatch). Rain gardens lead to economic and environmental benefits at all levels within a community, such as providing savings on infrastructure construction and maintenance as well as boosting property values and tax revenues.

Rain barrels help in keeping roof runoff from falling or discharging at the foundation of homes and buildings, as well as providing significant alleviation from misused potable water. On average, Americans use between 100-175 gallons of potable water daily. It is estimated that the average U.S. residence uses approximately 40% of its daily potable water to water lawns and gardens causing rises in water costs across the US, similar to the rise experienced in Franklin at the beginning of 2010 (Koomey, Dunham, and Lutz, 1995).

Rain barrels simultaneously mitigate stormwater and reduce potable water consumption. They are applicable in almost any setting while being highly cost-effective. Capacity of rain barrels ranges from smaller 50-75 gallon barrels to large 500-1500 gallon cisterns, like the kind used for Franklin's new LEED Gold Police Headquarters. Smaller barrels, like those that could be used at most homes, can cost between $50-$100 for premade barrels, though there are many resources available to teach people how to build their own for only $20-$30. Rain barrels are simple, easily maintained tools that relate to direct savings in water consumption and municipal water treatment. Larger cistern systems, like the one used in Franklin's police headquarters, can not only provide irrigation water, but the stored rainwater can also be reused for bathrooms and other non-potable uses.

Vegetated swales, rain gardens, and rain barrels are just three of a long list of feasible, effective stormwater management tools that could be employed by Franklin. These three were chosen for their effectiveness in regards to specific concerns raised by the city of Franklin regarding stormwater, low profile, low cost, and ease of implementation. Franklin is an excellent candidate for the implementation of a variety of green infrastructure techniques as a means of providing additional economic savings and income as well as enhancing or providing essential ecological services.

(1) Conduct soil analyses of multiple sites throughout Franklin in order to develop a comprehensive soil profile for the city

(2) Create a City of Franklin Rain Garden Registry where residents and commercial sites can record and track rain garden implementation. The site can also serve as an opportunity to share and research how-to and maintenance information as well as personal experiences (successes, failures, new ideas, Q&A, etc.)

(3) Implement plan to update traditional stormwater management infrastructure with vegetated alternatives wherever appropriate during routine or as-needed future maintenance and repair times

(4) Consider ordinance for all new construction to include viable GI practice(s) (rain garden, rain barrels, swales, pervious pavement, etc.) that can successfully capture rainwater

(5) Incorporate GI techniques into all new road construction projects (pervious street parking, extended curb gardens, vegetated medians, etc.)

Adaptive Reuse of Existing Buildings

By: Jolyn Newton

Applicable Definitions and Supporting Principles

Adaptive reuse refers to the repurposing of existing infrastructure and facilities that have outlived their original intent, and utilizing these structures for a new purpose. Reuse can apply to a wide range of existing infrastructure – old industrial facilities to vacant car lots or even abandoned churches. Building reuse supports environmental stewardship while stimulating economic growth and demonstrates social responsibility. In the simplest terms, adaptive reuse means using what has already been built. For Franklin, this concept has an even deeper meaning – preserving the historic architecture of the city. As a community that already demonstrates a high regard for historical infrastructure, adaptive reuse is a familiar notion. The historic structures lining Main Street from Five Points to the Square are all examples of successful adaptive reuse. Starbucks now occupies the former Corner Drug Store. Corner Drug Store moved into Dr. White's vacant medical office. Doctor's visits, children's school notebooks and double tall soy lattes – each generation a different use, but the building has remained.

Figure 1: "Rusty" stands testament to the industrious reuse at The Factory (Newton)

Causes and Concerns

History and nostalgia combine to drive the desire to maintain Franklin's historic core. When we move beyond this core, the view shifts dramatically along two key gateways. Just two blocks north along 5th Avenue North from the bustling center of Five Points lay a stretch of vacant buildings and concrete fields, an area of blight along a key pathway into the city center.

Traveling approximately one mile south along Columbia Avenue from Five Points, the roadside is dotted with For Sale signs along freshly paved greenspace. Follow the new road to its end and there sits a pile of rubble, some orange plastic, all neatly hidden from view by a patch of trees allowed to remain.

Figure 5: Blight and new development along two gateways to Franklin's historic core (Newton)

This example is used to illustrate the importance of reusing existing infrastructure and buildings, and the direct applicability to the City of Franklin. The blighted area is ripe for new development, is closer to the historic core, and its redevelopment would improve the vital first impression of visitors entering Franklin along Hillsboro Pike.

Benefits and Rewards

Reusing existing buildings enables the creation of multifunctional designs for mixed-use development and provides a balance between development and conservation, while recognizing the inherent sustainability of existing infrastructure. Potentially even more significant, utilizing existing infrastructure can benefit the local community by replacing blighted areas with new development while maintaining greenspace for recreational opportunities. Additionally, greenspace development requires a significant input of virgin materials whereas reuse integrates the embodied energy of the materials within current infrastructure.

Benefits of Adaptive Reuse for Franklin

Supports *City Sustainable Community Action Plan of 2009,* specifically

- Reduce energy usage throughout the community

- Reduce levels of greenhouse gas emissions
- Reduce the environmental impact of the building construction process
- Increase the use of energy –efficiency building systems
- Increase the use of environmentally friendly building materials

Preservation & Stabilization - protecting and preserving open space for recreation and future enjoyment, minimizes sprawl. Preserve historical integrity of community while stabilizing vacant properties. Stabilization prevents vandalism and halts site deterioration.

Figure 7: Vacant commercial window on 5th Ave (Newton)

Energy & resource conservation – recognizing and conserving the embodied energy of existing infrastructure. New construction requires energy-intensive processes, new materials development and transportation. Conserve natural resources and virgin materials while diverting materials from the waste stream. Capitalize on existing city infrastructure (electric, water, sewer, etc.) while considering the physical impacts on the environment during new development.

Local economic development – repurposing buildings often requires more labor than new construction, creating more local jobs, which in turn inject funds into the local economy. (Peterson, 2010). Promoting economic development in depressed or blighted areas encouraging and enabling neighborhood revitalization. Increasing city property tax revenues, studies have demonstrated that concentrated development results in a higher property tax return per acre over sprawl development.

National/Regional Best Practices

> *By taking buildings that are either historical, dated or in older, established areas of the city and ensuring their presence long into the future, adaptive reuse is one of the ultimate expressions of sustainability. Not only does this take advantage of materials that are already there (which is environmental* and *economical), but it also respects a city's history and plays an important role in community revitalization. Adaptive reuse also demonstrates that old buildings make great places for new ideas. – Downtown Phoenix Journal (Artibise, 2009)*

While examples of adaptive reuse are plentiful, clearly identified best practices for such development are not. Most often, direction for reuse is found within historical preservation ordinances and codes. The consideration of non-historical properties for reuse is an emerging method which

requires city planners to consider alternative processes for permitting construction. Several communities have developed guiding principles specifically targeting adaptive reuse. Many others have addressed reuse through their overall sustainable community development guidelines. This section will provide examples of such principles and guidelines.

The **Commonwealth of Massachusetts** has developed guiding principles for sustainable development. Among those is principle number one, Concentrating Development and Mix Uses:

> *Support the revitalization of city and town centers and neighborhoods by promoting development that is compact, conserves land, protects historic resources, and integrates uses. Encourage remediation and reuse of existing sites, structures, and infrastructure rather than new construction in undeveloped areas. Create pedestrian friendly districts and neighborhoods that mix commercial, civic, cultural, educational, and recreational activities with open spaces and homes. (Commonwealth of Massachusetts)*

The **City of Dover, New Hampshire** has adopted a Form Based Code (FBC) "which places more emphasis on community character and the impact development has on the public realm than traditional zoning does" (Planning Department, 2011). The code encourages responsible development that reuses existing infrastructure in an effort to position the city for positive and flexible redevelopment.

> *A guiding principal behind the development of a FBC is that the buildings and physical alteration of land is more long lasting than the initial use found within the building that is constructed, and we should be concerned about community character and appearance. (Dover)*

The small town of Eustis, Florida has adopted a similar approach to that of Dover by using a FBC to develop a comprehensive plan for sustainable land use development which maximizes existing transportation infrastructure, enhances the livability of the city, preserves physical resources and promotes sustainable development. Within this plan are accommodations for redevelopment to encourage future growth within the existing urban area and prevent sprawl (Eustis Florida, 2011).

Local Successes

Several great examples of adaptive reuse exist within Franklin already. The most prominent is The Factory at Franklin, which converted an abandoned factory in a bustling center for shopping, dining and entertainment. Traveling from the Factory toward the square, a new and popular diner occupies an existing building that most recently was home to The Boat Locker.

Figure 6: Original factory front view (History Gallery); 2011 factory side view (Newton)

Examples can be found in most every community. What differentiates communities such as Lexington, Kentucky is the promotion and recognition of this type of development. The local non-profit, Blue Grass Trust for Historic Preservation - an advocate for historic preservation, has created a walking tour to promote their adaptive reuse within the historic core.

Figure 8: The Boat Locker (Newton)

Recommendations

1. Create an interdepartmental working group to assess current development codes and standards in consideration of sustainable development principles. Determine if current building codes and regulations create barriers for reuse.
2. Explore form based codes in order to maintain the historic character and integrity of Franklin while creating sustainable growth and development.
3. Develop a permitting review process that ensures a thorough review of vacant or brownfield sites has been conducted and analyzed for feasibility prior to permitting greenfield development. Greenfield development permits should be accompanied by sufficient justification of such review.
4. Encourage adaptive reuse through permitting incentives.

Alternative Energy

By: Coe Foutch

According to Franklin's Department of Planning and Sustainability, a major emphasis is to be placed on the development and implementation of alternative energy sources. Whereas the city has already taken measures relevant to this initiative (municipal LEED resolution, energy efficient lighting in public parks, etc.), finding areas in which the city can improve energy distribution in a fiscally sound, minimally invasive manner is relevant toward other long-term goals concerning energy infrastructure.

Applicable Definitions and Supporting Principles

It is important to reiterate the point that development of alternative, efficient energy systems is highly governed by the economic impact they can provide, not least of which includes the timeframe of recuperation of startup funds versus implementation and maintenance costs. For this reason, we will be placing strong emphasis on the development of energy systems that are minimally invasive in terms of budgeting, legislation, and maintenance.

Franklin's past record of examining viable alternative energy initiatives has proven to be quite efficacious, especially as compared to that of similar cities within a confined geographic radius. Suggestions for further examination for successful alternative energy initiatives will be discussed in a detailed fashion, but some of the ideas

- Examination of policies within the city that may inhibit or promote specific types of alternative energy implementation

- Working not only with Nissan but with businesses in local commerce hubs for EV fueling stations
- Investigation of areas conducive to solar arrays and potential payback periods for such infrastructure
- Investigation of TVA-assisted programs promoting implementation of ground source heat exchange systems in new construction projects

Causes and Concerns

Upon examining alternative energy initiatives that are both apropos and germane to Franklin, it is logical to examine one of Franklin's large corporate headquarters, Nissan North America. With the recent introduction of the Nissan Leaf which marks a considerable advancement in the production scale of vehicles powered entirely by alternative fuel, there exists a common question that is pertinent in the development of all alternative energy promotions: Is the infrastructure in place to promote this?

According to research conducted by Nissan, the average person that pre-ordered a 2011 Nissan Leaf is 45 years old, college educated, a homeowner, and earns a household income of $125,000 annually. Upon examination of cities in Tennessee with population greater than 50,000 (Loveday, 2010), Franklin's median numbers come closest to this in terms of all parameters, with exception to the age range. Unfortunately, available census data only provides median and mean figures, as opposed to the number of households matching the criteria, which would be a more effective measure of marketing applicability.

Benefits and Rewards

Whereas Nissan has introduced the idea of providing free charging stations to their pre-order customers, access to these stations is limited by convenience (Nissan North America, 2011). As a potential boon to the commercial sector, we propose initiatives to incentivize electric charge stations in highly trafficked, pedestrian-friendly commercial areas (e.g. Cool Springs Galleria, Cool Springs Boulevard shopping area). Introduction of charge stations in these areas would potentially incentivize customers to patronize retail areas as well as promoting foot traffic to other shops for the vehicle's charge duration.

Infrastructure expense for implementing electric charge stations is quite minimal, as fuel can be obtained from the existing power grid. The repayment window for introducing these systems would be dependent upon fees for use, but it is also important to note that attraction of customers with electric vehicles would provide an additional segue to commercial profits. Additionally, implementing

commercial electric charge stations would promote Franklin as a spearhead city for alternative fuel vehicles in a conspicuous manner. This could further promote purchase of a vehicle whose headquarters are based in Franklin and truly put the city on the map for innovation in sustainable design within the South.

Regional Best Practices

Examining use of alternative energy in a more direct manner for residents and industry is another area that is relevant in reducing dependency upon common energy resources, but perhaps more importantly, doing so can lead to reduced long-term costs for the consumer. It is commonly known that Tennessee Valley Authority created a program that incentivizes the incorporation of non-grid power sources to be implemented in both new and existing property developments. Electricity generated from these sources is cycled back into the municipal power grid and sub-metered by the TVA. The owner of the property is then credited for the amount generated. This system allows for a more
streamlined approach to seeking alternative energy than attempting to power property through non-grid means.

Solar energy, while impractical in many scenarios, does offer many options in this geographic area, depending upon the location of a specific property. Solar energy also offers minimally invasive retrofitting of existing infrastructure compared to many other energy types, needing primarily uninhibited, available roof space, panels, and sub-meter installation by TVA. Estimated payback periods for installation of rooftop solar arrays range from seven to eleven years, depending upon various factors such as available surface area and climate variability. This estimate does not take into account the many incentives that are already in place for installing renewable power sources in new construction, which would have potential to drastically reduce the payback period and net profitability of installation (“Green Techno Log”).

Recommendations

It is our proposition that in adjunct with Franklin's current LEED initiatives in public buildings, further examination of localized clean energy generation be conducted. This concept could be brought into the non-public sector by further investigation of existing incentives for incorporation of these systems, as well as consideration by the city of Franklin to endorse their use. Using solar arrays as a primary example of an energy type that can readily be used in retrofits of existing property, this concept can be extrapolated to various other energy types. As a single example, in new construction projects, ground source heat exchange shows great potential in energy savings. Lipscomb University in Nashville recently installed geothermal heating and cooling in an effort to combat energy expenses as well as promoting clean energy usage. This system, set up with assistance from TVA, is expected to save Lipscomb roughly $80,000 annually in heating and cooling costs (Lipscomb University).

Alternative energy exploration within the city of Franklin is essentially dependent upon where the city is looking to take itself over the next few decades. Sustainable practices as related to energy must be examined from a critical lens with respect not only to global consciousness, but also fiscal responsibility. The strategies mentioned previously are examples of structural changes that can promote positive economic return in the long-term, if not almost instantly. Investment in alternative sources of power can provide long-term stability in a market whose prices have proven to fluctuate. Another factor to consider is where Franklin wants to be on the proverbial sustainability map. Some endeavors are more conspicuous than others, if the city wants to raise community consciousness of its efforts to promote sustainability.

Food Security

By: Cathleen Burrell

Albert Einstein said, "Setting an example is not the main means of influencing another, it is the only means." Franklin has the opportunity to be the example of a fully sustainable and financially sound community. It is a richly diverse and highly engaged community, thriving with a blend of urban and rural area, modern and historical spaces, all while remaining fiscally healthy. Underneath all of this are vibrant, healthy citizens who currently have access to a city government that includes sustainability in its planning to include buildings and its recent Blue Bag recycling program. One area that does remain unspoken is food.

Applicable Definitions and Supporting Principles

Franklin lacks a publicized integrated food policy or a methodology that places food planning in its policy making decisions. Traditionally, food has not been an issue for city or county planners because it is seen as a rural issue rather than urban. In a location such as Franklin, which values individual freedom and the limited role of government, intrusion into the kitchen is not conducive to centralized planning. Additionally, most local government planners are not focused on the planning of land use in food production as it affects a food shed. First, the term food shed is new. Second, the focus is on maintaining a solid tax base while ensuring property values remain high. Unfortunately, urban sprawl and the success of large industrial farmers, which is seen as successful growth to many, is causing a slight degradation to the short and long term ability of the land to provide for its citizens. No one can escape the need of food. The purpose of local government is to improve the greater welfare of its citizens without increasing the tax burden or governmental interference. Creating and upholding a food security policy will accomplish this.

An integrated food policy or food security policy is one that:

> "Provides healthy food to meet current food needs while maintaining healthy ecosystem that can provide food for generations to come with minimal negative impact to the environment…encourages local production and infrastructure…it is humane and just protecting farmers and other workers, consumers, and communities." (APHA, 2007)

Food policy starts at the local government. With the unique command of community spirit and ability to impact day to day activity with recommendations, it is beneficial for the city to become involved in food security and policy planning.

Causes and Concerns

Food security policy planning is important for the long and short term success of any locale. Franklin, TN is particularly vulnerable due to its availability of open land and opportunity to improperly plan for the use of land or permit its degradation. Recently, Middle Tennessee has been the victim of severe weather, obviously including the Nashville flood of 2010. The National Weather Service indicates that over the past 10 years, severe weather has increased by 151% in the Middle Tennessee area.

Coupled with extreme and unpredictable weather patterns, the population of Franklin has steadily increased over the past few years.

With a high national ranking in standards of living, Franklin is a desirable place to begin or relocate a family. Franklin excels in providing comfort, convenience, and care for its citizens. It is extremely likely

that similar population growth is going to continue. In the last ten years, Franklin has also had an increase in chain grocery stores to include Whole Foods, Trader Joe's
and Wal-Mart. While selection and access are at a premium currently, the average item of food will travel nearly 1500 miles prior to arriving at a local grocery store (Wilson, 2007). The impact of supply chain operations and distribution support to provide this vast network of national chains places a strain on the nationwide ecosystem to include further impact on arable land that will be converted to roads. As previously mentioned, this removal of permeable surface will have an impact on storm water runoff as well as access to water, which further degrades our ability to produce foods.

Benefits and Rewards

Franklin also finds itself in need of divestiture of its tax base. Currently, the sales tax represents a minimum of 44% of the city's income (Budget, 2011). In a nation where 17% of the workforce is employed in the food industry and each family spends approximately 10-40% of its income on food, a high portion of the city's spending power comes from food (APHA, 2007). Franklin needs to take a moment and reconsider the impact that food has on its ability to operate. Food impacts every aspect of daily operations. As a basic human need, the possibilities to capitalize on promoting the long term success of food security in the region are in the best interests of the city government.

Franklin is not alone. Food affects everyone and everything. Currently, 64 billion dollars worth of the food produced in the United States is exported. Farmers, both small and industrial, depend upon these exports to continue operations. Thirteen percent of the GNP is associated with food operations and approximately 1/5 of the U.S. workforce is employed by the food industry (APHA, 2007). With food comes waste. Food scraps alone are a large portion of our national landfills. For every 4.5 pounds of trash that every American creates each day, 7/10ths of a pound are currently reported as food scraps. Approximately 1/5 of our landfill space across the nation could eliminated if we even though about composting and regenerated fertile soil.

On top of trash, food affects the nation's health. Currently, the US faces an obesity epidemic as nearly 1/3 of the population is clinically obese (CDC, 2010). This can lead to other health issues and problems such as heart disease, which is the primary cause of death in Middle Tennessee in 2007 (CDC, 2007). Not only does this place a tremendous burden on our health care system as well as the productivity of our nation, but it also impacts local governments in the cost of ambulatory care that are either held by the city or passed down from the federal government to the states, and ultimately to the city governments. This waterfall effect eventually creates higher taxes and fewer services which do not promote the thriving local economy that we all seek.

Franklin, however, has been able to promote food security in the private and non-profit sectors. The Franklin Farmers Market is a strong success. It's "Beanstalks for Kids" and "Growing Kids Education Garden," in conjunction with Harlinsdale Farms, uniquely positions it to provide access to locally produced food but also that it provides education and engagement services to youth and the community at large. "Beanstalks for Kids," an electronic newsletter, discusses pesticide use and its impacts, how to select proper fruits and vegetables, as well as recipes for healthy treats. The Franklin Farmer's Market Guidelines for vendors make it unique. Distance requirements prohibiting produce from outside state lines and time zones set it apart from other markets such as the Nashville Farmer's Market, which has no such restrictions. In its standing as a 401c Not for Profit, the Franklin Farmer's Market can receive donations from private industry in the area, to which Tractor Supply Company has been a large benefactor in the Harlinsdale Farms "Growing Kids Education Garden." The cooperation of business and community is the type of activity that the Franklin City government can engage and generate.

Regional Best Practices

Knoxville, TN was the first city in the United States to have a Municipal Food Policy Council. This Council became the standard for the Conference of Mayor's Food Policy Project and demonstrates that Tennessee can lead the nation in food security policy and planning. An integrated food security policy will bring a unique perspective to city planners. Food is the one area where input, mechanisms, structures, processing, distribution, acquisition, preparation, consumption, metabolism, and biological degradation occur. From water to land, transportation services to air, building to public health, welfare to waste handling, food touches every aspect of our lives and of business. Just as a seesaw can balance, the teetering of any of these pairs has the opportunity to throw food security out of balance. The recent Nashville flood impacted Franklin. It was not only water on the roads that prevented fresh fruit from arriving at Whole Foods. It affected the spirit of the citizens. It affected the income of the city. Food security is a basic human need. The improved health, spirit, livelihood, and care of land to provide food for generations to come will not only promote Franklin as a great place to live, but it will also reinvigorate the local economy, providing possible new revenue sources for the city.

Franklin is growing for a reason. Food policy empowers a community to tie together all aspects of sustainability because it demands it. Sustainable food policy cannot occur without sound water management, land use, energy management, and change management to educate the citizens on healthy living. Food policy completes the circle. The City of Franklin has a unique opportunity to lead by

example and optimize its current sustainability planning by evaluating the system holistically, which food by creating a food policy will demand.

There are many piecemeal solutions to food policy that are occurring all over the world. The trick is finding solutions that are holistic and sustainable. This is where many cities and nations are running in to issues. Many communities are forced to focus on immediate problems such as food deserts, poverty driven starvation, and cultural challenges. The successful locales have found that an overarching food policy council that is able to gain a holistic perspective of the situation at hand and then develop a solution have been most successful.

Vancouver is a great example of this. After mounted public awareness of food issues, the city decided to take action. The New York City Global Partner's Exchange Report highlights this:

> The motion resulted in the creation of a Council-Led Food Policy Taskforce whose purpose was to assess the best way for the city to be engaged in food systems issues. As a result of the Task Force's year-long investigation, the Vancouver Food Policy Council was created in 2003. This occurred concurrently with the creation of two Food Policy staff positions in the City Social Planning Department. VFPC is integral in supporting the creation of a just and sustainable food system, defined as one in which food production, processing, distribution, and consumption are integrated to enhance the environmental, economic, social, and nutritional health of a particular place. (NYC Global Partners, 2010)

Vancouver has over the past few years been active in promoting local beekeeping, community gardens, and backyard hen farms. The council has identified areas of focus to include

1. Community Economic Development
2. Ecological Health
3. Social Justice
4. Collaboration and Participation
5. Celebration.

Vancouver is not alone. Cities across the globe to include many in the United States are finding that local food policy councils are able to identify locale-specific food related issues that can be improved. Hartford, CT is another great example of a city leading by example to ensure its citizens have access to healthy, affordable, and sustainable food. Hartford has different goals that Vancouver but the bottom line exists that a local food policy council is necessary to identify regional issues and identify solutions.

In Hartford,

> Through correspondence, annual reports, and City Council hearings, the Commission advises municipal officials on key issues relating to food and nutrition in Hartford. In 2007, we have identified five action steps that can be achieved through city leadership this year: Renew a $60,000 food pantry grant program initiated by the City Council last year, expand Food Stamp and WIC enrollment outreach, increase school breakfast participation rates, improve coordination among Hartford's farmers markets, and expand the Healthy Food Retailer Initiative with neighborhood bodegas and corner markets. (www.Hartford.gov, 2011)

As you can see, Hartford takes a more activist role in its Food Policy Council to drive policy changes within the city. The variances in outcome of the food policy councils across the world are not at issue here. What is at hand is the fact that the City of Franklin is not currently evaluating food on a holistic level and integrating this with its policy decisions such as water, land, and building codes. Food Policy Councils in Vancouver, Hartford, Austin, and Johnson County, IA are all demonstrating the value of this synergy. IT is time that the City of Franklin consider evaluating food through a different lens.

Recommendations

As we see from cities across the continent, Franklin can achieve all of this. In order to uphold Franklin's rich historical and natural traditions while maintaining limited government involvement in the lives of the citizens, we recommend that the City of Franklin commission an Integrated Food Security Policy Council in order to support the long term livelihood of the City's food shed assets. The council will be multi-functional and composed of individuals to represent small scale farmers, business leaders, city officials, research leaders, consumers, and developers. The focus of this council will be to build relationships with one another and the community at large, to educate the community about the food shed and its value, as well as providing information about policy decisions affecting the food shed.

The Integrated Food Security Council will be based upon the framework of functioning councils across the United States. This includes Knoxville, TN, Johnson County, Iowa, Hartford, CT, and Austin-Travis County, TX. The lessons learned from these councils are the following:

- Build a strong and diverse collaboration
- Create broad support
- Develop strong leadership
- Use research
- Build personal relationships
- Combine creativity and sensitivity to the local situation

The focus of the council is not to create policy. These local governments have used a food council as a resource to provide guidance on the pulse of the public, technical support for land, building, health, and other issues that may arise, as well as determining what the best financial recommendations for the city are. The council will be established with the following guidelines:

- To inform and monitor
- Organize a food constituency
- Have access to decision makers
- Review budget reports and planning
- Assist in Food Policy Development
- Highlight and take positions on food issues
- Catalyst for projects

The council is a volunteer based organization or can be staff of the city. This has been established in both manners at the different locations and has worked satisfactorily in all areas. Financial constraints restrict addition of staff, and the commissioning of the council has shown to provide incentive for community leaders to support the initiative.

Once the city has decided to create the council, it will need to move begin moving forward. The best practices for beginning a food council from the locations above are as follows:

- Define goals
- Organize a core group
- ID and recruit stakeholders
- Convene to group
- Commit to moving forward
- Structure vs. action
- Self-Educate

A food policy council is not a tangible solution. It is a step in the right direction. What these locales have found is that by creating a council, the city is acknowledging that food has a place in the planning model. Food affects everyone. Food affects everything. It is time that city planners began considering the impact of building renovations, location of supermarkets and restaurants, roads, bus stations, routes to markets, trash runs, and composting, and how that can be affected by simple fee based initiatives during development or renovations.

Councils of all types can be successful with any type of resources. The key to successful council, irrelevant of its focus, is leadership. The unique aspect of the Food Policy Council is that it brings

together individual leaders from various aspects of the community to include small scale farmers, business leaders, city officials, research leaders, consumers, and developers. Bringing together a diverse group of individuals to focus on resolving the community issue of food security will bring about a successful solution.

The question at hand is "should Franklin allocate budget funds initially to this council?". Recommendation: No. The City needs to identify advocates in each area, bring together a city planner, and commission the council so that it has teeth with its recommendations. With time, resource allocation issues will arise. The initial issue is to identify the immediate need to bring food security in to the City's planning radar. If this can be accomplished without an already tight budget, then success is at hand.

The point of all this is that the City of Franklin can be a leader. It is a successful community but it could be so much better. By creating a Food Policy Council that evaluates policy in a holistic manner and makes strong recommendations that identifies areas where policy will impact access to healthy, affordable, and sustainable food sources, then the City of Franklin will use its only means to protect and safeguard its citizens.

Conclusion

This Sustainable Best Practices Plan was designed so that successful implementation will lead to further practices. Tracking the progress is essential and the first step of the Planning and Sustainability Department is to understand the current state of sustainability. Franklin should continue tracking and benchmarking throughout 2011.

Tracking progress will allow Franklin to evaluate advancement over time as well as help prioritize tasks and further improvement. With every implemented best practice, the process starts over. Franklin, TN is committed and has expressed motivation towards sustainability as growth and development of social, economic, and environmental issues.

Many of the ideas that are outlined in this plan must be performed in the community, not the government. It is important that the Planning and Sustainability Department continues to function as a resource for the residents and businesses that will use this plan for development. The Best Practices outlined in this plan can be a resource for other communities. The Planning and Sustainability Department has a network of students, residents, professionals, and businesses that reach for positive change in the region which is a remarkable advantage in moving forward in a sustainable way.

APPENDIX

TABLE 1: NOTABLE SUSTAINABLE STORMWATER MANAGEMENT SUCCESSES FOR FRANKLIN, TN
1. Revision and Implementation of **Stormwater Management Ordinance 2010-68**
2. Completion of Phase I of Franklin's **Integrated Water Resources Plan**
3. Chapter 5, Section 5.5 of Franklin's **Zoning Ordinance: Open Space Standards**
4. **Stormwater Demonstration Site** (in development)
5. Stormwater Management Master Plan (in development)
6. **2010 Greenways and Open Space Plan** (Franklin maintains *green space:resident* ratio of 12.52:1,000 – more than double the national average)
7. **Pervious trail system** along the Harpeth River and Spencer Creek promoting sustainable incorporation and management of greenways AND blueways (planning stage)
8. Promoting Education and Awareness: "KIDS-Be a Water Hero," Green-Tips, etc.
9. New Police HQ stormwater management features: green roof, cistern, stormwater reuse system
10. Tree care/planting programs: Tree Inventory, No Tree-Topping Ordinance, 250% increase in city-wide tree plantings from 2009 to 2010

TABLE 2: CASE STUDY EXAMPLES OF ECONOMIC BENEFITS OF GI PROGRAM IMPLEMENTATION		
Where	**Description**	**Benefit**
Maryland & Illinois	Implemented a comprehensive LID plan for new residential developments to manage stormwater	Saved $3,500-$4,500/lot
General Study	Designing and implementing LID projects vs conventional SWMS	Cost reduction of 25-30%
Shepard's Vineyard Apex, NC	Subdivision developed 40 homes bordering a local greenway that passed along the development	The 40 greenway-adjacent homes sold first and for $5,000 more/lot
Auburn Hills Wisconsin	Subdivision, incorporated GI techniques and preserved 40% of the site as open space	Saved $761,396, even with higher initial landscaping costs for GI
Gap Creek Sherwood, AK	Revised subdivision plan to include GI projects, increased open space from 1.5 acres to 23.5 acres	Lots sold for $3,000 more and cost $4,800 less to develop, resulted in overall added profit of $2.2mil
Prairie Glen Germantown, WI	Preserved 59% of subdivision site as open space with hiking trails for residents, incorporated LID and conservation subdivision design concepts	Saved over $600,000, reduced use for impervious surfaces (roads/parking/sidewalks)
Lockwood Folly Brunswick County, NC	LID reduced size needed for required stormwater pond which made room for another lot	Increased developer revenues by $91,000
Congaree Bottom Hardwood Swamp, SC	Preserved natural wetland/swamp area cited as a natural water-quality improvement site (filtered toxins, sediment, nutrients from runoff) from being converted into man-made equivalent	Saved $6.7 million
Somerset, MD	Constructed 300-400ft^2 rain gardens on each 10,000ft^2 residential property instead of installing new storm drains and sewers and other conventional stormwater infrastructure	Saved $4,000/lot, saved $300,000 on construction of city curbs, sidewalks, and gutters
Kane County, IL	Calculated stormwater management potential with inclusion of rain gardens in upstream locations, eliminated need for added culverts/drains	Raised property values almost $22,000/acre, potential infrastructure development savings of $3.3-$4.5 million

TABLE 3: CASE STUDY EXAMPLES OF ALTERNATIVE ENERGY EXAMPLES		
Where	**Description**	**Benefit**
Nashville, TN	Implemented ground source heat exchange system in new construction at Lipscomb University	Savings of up to $100,000 annually in heating and cooling
Northwest Oregon	Incorporation of EV charging stations into urban and suburban infrastructure (commercial)	Reduction in total city emissions, increase in sales of EV
Redmond, WA	Introduction of 5,000 EV charging stations in metropolitan area	Increase in sales of EV
North Brunswick, NJ	Installation of Solar rooftop array on Toys 'R' Us and Babies 'R' Us stores	Provides equivalent of 33-67% of buildings' electrical consumption
Pataskala, OH	Small-scale solar rooftop array placed on RedHawk Energy HQ	Estimated production of 103MWh over lifespan of 2.64kW array

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